

WHAT IS CLAIMED IS:

1. A stop and start control apparatus of an internal combustion engine comprising:

5 a stop control unit which controls a crank angle of the internal combustion engine within a range of a predetermined crank angle at a time of stopping the internal combustion engine; and

a start control unit which starts the internal combustion engine by a cranking unit at a time of starting the internal combustion engine,

10 wherein the start control unit starts the internal combustion engine by different methods when there is a probability that the internal combustion engine does not stop within the range of the predetermined crank angle and when the internal combustion engine stops within the range of the predetermined crank angle.

2. The stop and start control apparatus of the internal combustion engine according to claim 1,

wherein the cranking unit is an electric motor, and

25 wherein the start control unit starts the internal combustion engine by applying, by the electric motor, a larger torque when there is a probability that the internal combustion engine does not stop within the range of the predetermined crank angle than when the internal combustion engine stops within the range of the predetermined crank angle.

3. The stop and start control apparatus of the internal combustion engine according to claim 1, wherein the start control unit starts the internal combustion engine by a first electric motor when the internal combustion engine stops within the range of the predetermined crank angle, and by a second

electric motor different from the first electric motor when there is a probability that the internal combustion engine does not stop within the range of the predetermined crank angle.

5 4. The stop and start control apparatus of the internal combustion engine according to claim 3, wherein the first electric motor is a motor generator functioning as a motor and an electric generator, and wherein the second electric motor is a DC starter functioning as a motor.

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 5. The stop and start control apparatus of the internal combustion engine according to claim 2, wherein the start control unit starts the internal combustion engine by combusting, during an expansion stroke, a fuel supplied at the time of
15 stopping the internal combustion engine when the internal combustion engine stops within the range of the predetermined crank angle, and wherein the start control unit starts the internal combustion engine by the electric motor when there is a probability that the internal combustion engine does not
20 stop within the range of the predetermined crank angle.

 6. The stop and start control apparatus of the internal combustion engine according to claim 1, wherein a case when there is a probability that the internal combustion engine does
25 not stop within the range of the predetermined crank angle includes a case when an actual crank angle at the time of stopping the internal combustion engine is out of the range of the predetermined crank angle.

30 7. The stop and start control apparatus of the internal combustion engine according to claim 6, wherein the actual crank angle is outputted from a crank angle sensor detecting the crank angle of the internal combustion engine.

8. The stop and start control apparatus of the internal combustion engine according to claim 1, wherein a case when there is a probability that the internal combustion engine does not stop within the range of the predetermined crank angle includes a case when an estimation accuracy of an estimating processing of the crank angle at the time of stopping the internal combustion engine is smaller than a predetermined standard.

9. The stop and start control apparatus of the internal combustion engine according to claim 8, wherein the estimating processing estimates the crank angle based on an output from the crank angle sensor of the internal combustion engine and a rotation detecting output from the electric motor functioning as the cranking unit.

10. The stop and start control apparatus of the internal combustion engine according to claim 9, wherein the estimating processing corrects the rotation detecting output from the electric motor by the output from the crank angle sensor.

11. The stop and start control apparatus of the internal combustion engine according to claim 1, wherein a case when there is a probability that the internal combustion engine does not stop within the range of the predetermined crank angle includes a case when there is a probability that the crank angle changes after the stop of the internal combustion engine.

12. The stop and start control apparatus of the internal combustion engine according to claim 11, wherein a case when there is a probability that the crank angle changes includes a case when the crank angle changes by receiving an external force after the stop of the internal combustion engine.

13. The stop and start control apparatus of the internal combustion engine according to claim 1, wherein the stop control unit automatically stops the internal combustion engine when
5 a predetermined stop condition is satisfied, and wherein the start control unit automatically starts the internal combustion engine when a predetermined start condition is satisfied.